35.8cm COLOUR TFT-LCD MODULE
(14.1 TYPE)

LT141DENQP00
(p-Si TFT)

TENTATIVE

FEATURES

(1) 14.1"SXGA+(1400x1050 pixels) display size for notebook PC
(2) Light weight, High Brightness(200cd/m2) design
(3) Bezel less structure

MECHANICAL SPECIFICATIONS

Item	Specifications
Dimensional Outline (typ.)	302.9(*W*) x 229.0 (*H*) x 4.8(*D*) mm
Number of Pixels	1400(*W*) x 1050(*H*) pixels
Active Area	285.6(*W*) x 214.2(*H*) mm
Pixel Pitch	0.204(*W*) x 0.204(*H*)
Weight (Typ)	249 g
Backlight	Single CCFL, Sidelight type

ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Checked Terminal [4)]
Supply Voltage	V_{DD}	-0.3	+4.0	V	V_{DD} - GND
Input Voltage of Signals	V_{IN}	-0.3	V_{DD}+0.3	V	LVDS interface
FL Driving Voltage	V_{FL}	-	2.0	kV(rms)	
FL Driving Frequency	f_{FL}	-	100	kHz	
Operating Ambient Temperature	T_{OP}	0	+50	°C	
Operating Ambient Humidity	H_{OP}	10	90	%(RH)	
Storage Temperature	T_{STG}	-20	+60	°C	
Storage Humidity	H_{STG}	10	90	%(RH)	
Operating Temperature for Panel	-	0	+60	°C	

ELECTRICAL SPECIFICATION

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	V_{DD}	3.0	3.3	3.6	V	
FL Input Current	I_{FL}	3.0	6.0	6.5	mA(rms)	
FL Driving Voltage	V_{FL}	580	650	720	V(rms)	I_{FL}=6.0mA(rms)(Reference)
FL Driving Frequency	f_{FL}	30	50	80	kHz	
FL Starting Voltage	V_{SFL}	1300	-	1950	V(rms)	0°C

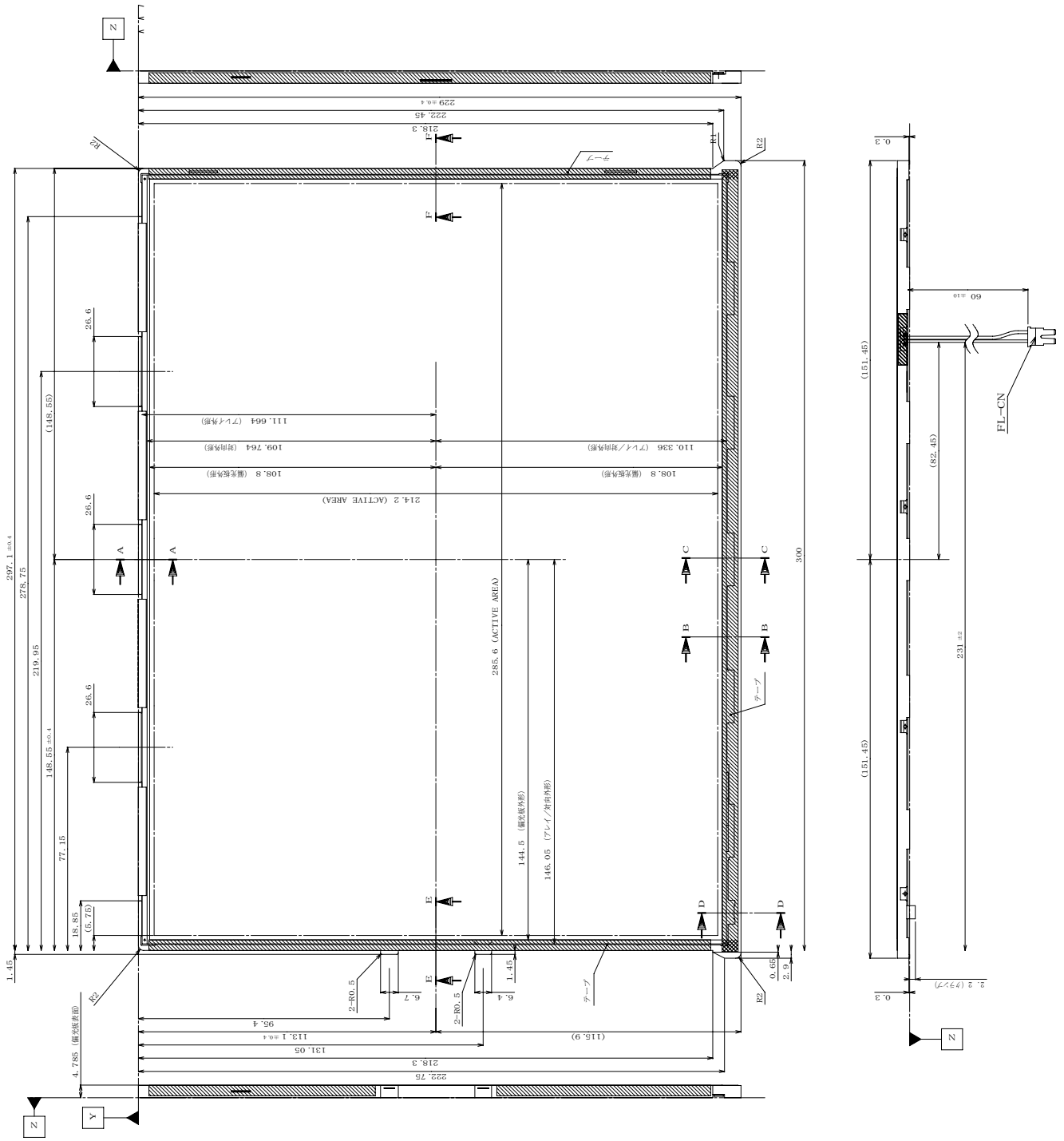
OPTICAL SPECIFICATION (*T*a=25°C)

Item		Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio (*CR*)		120	200	---	---	
Response Time	(t_{ON})	---	---	50	ms	
	(t_{OFF})	---	---	50	ms	
Luminance (*L*)		160	200	---	cd/m^2	I_{FL}=6.0 mA(rms)
Viewing Angle	U/D/R/L*	10/25/30/30	-	-	degree	

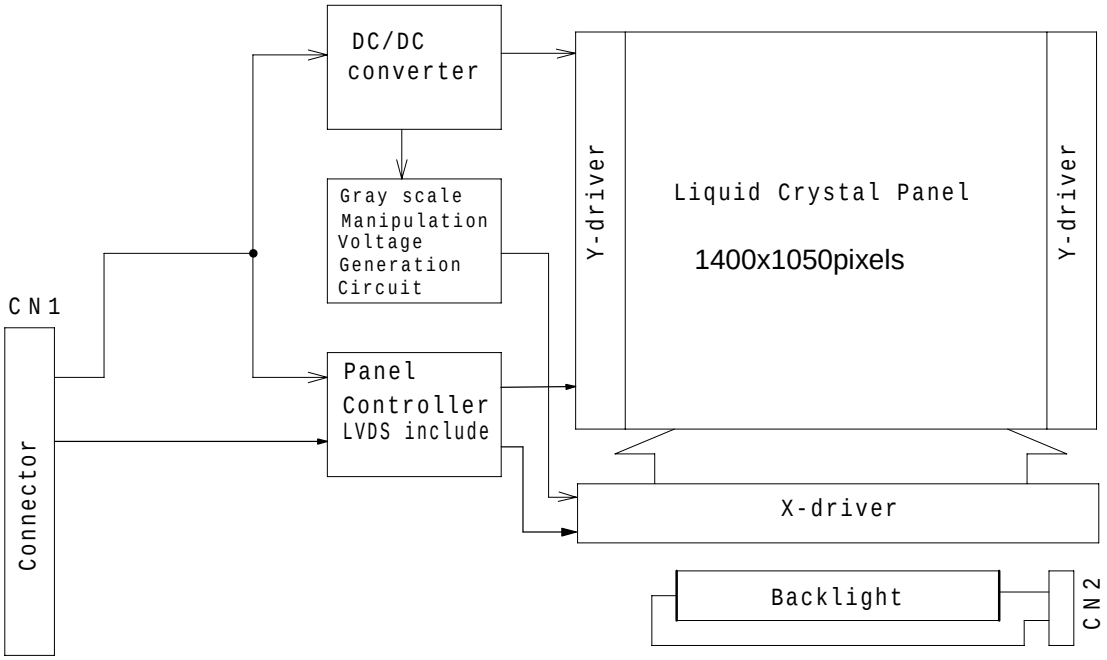
*U: Upper side, D: Down side, R: Right side, L: Left side

DIMENSIONAL OUTLINE

TENTATIVE



BLOCK DIAGRAM

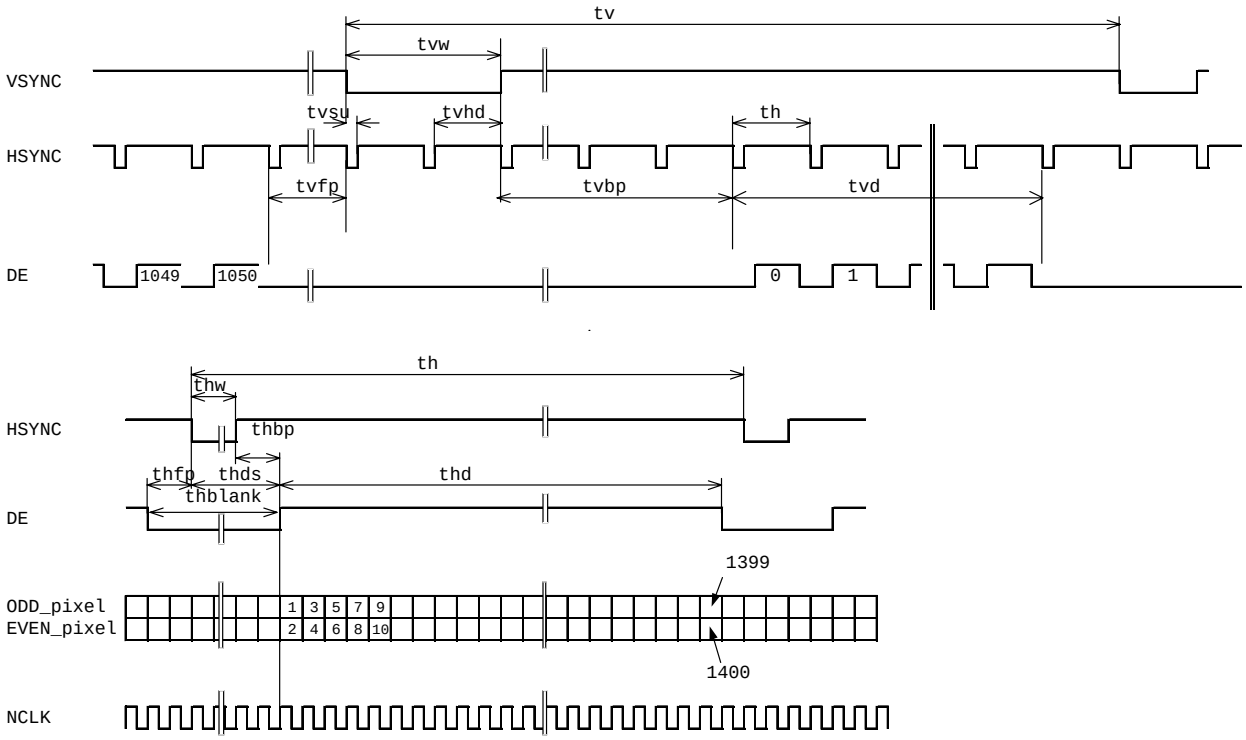


1400 pixels

1, 1	2, 1		X, 1			1400, 1
1, 2						
1, Y			X, Y			
1, 1050						1400,1050

1050 pixels

TIMING CHART



TIMING SPECIFICATION [1) 2) 3) 4) 5) 6) 7)]

Item	Symbol	min.	typ.	max.	unit
Horizontal Scanning Term	*t*h	836 x *t*c	844 x *t*c	844 x *t*c	clock
H-sync Pulse Width	*t*hw	4 x *t*c	-	-	clock
Horizontal Front Porch	*t*hfp	4 x *t*c	-	-	clock
Horizontal Back Porch	*t*hbp	16 x *t*c	-	-	clock
Horizontal Blanking Period	*t*hblank	136 x *t*c	144 x *t*c	144 x *t*c	clock
Horizontal Display Term	*t*hd	700 x *t*c	700 x *t*c	700 x *t*c	clock
Frame Period	*t*v	1060 x *t*h	1066 x *t*h	1066 x *t*h	line
Frame Frequency	-	40	60		*Hz*
V-sync Pulse Width	*t*vw	2 x *t*h	-	-	line
V-sync Set Up Time (to H-sync)	*t*vsu	8 x *t*c	-	-	clock
V-sync Hold Time	*t*vhd	8 x *t*c	-	-	clock
Vertical Front Porch	*t*vfp	2 x *t*h	-	-	line
Vertical Back Porch	*t*vbp	6 x *t*h	-	-	line
Vertical Display Term	*t*vd	1050 x *t*h	1050 x *t*h	1050 x *t*h	line
Clock Period	*t*c	17.544	18.519	27.787	ns

Note 1) Refer to “TIA/EIA Timing Chart”

Note 2) If ENAB is fixed to "H" or "L" level for certain period while NCLK is supplied, the panel displays black with some flicker.

Note 3) If NCLK is fixed to "H" or "L" level for certain period while ENAB is supplied, the panel may be damaged.

Note 4) Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality.
There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency), even if the condition satisfies above timing specifications and recommended operating conditions shown in 3.

Note5) Do not make *tv*, *tvdh* and tvds fluctuate.
If *tv*, *tvdh*, and *tvds* are fluctuate, the panel displays black.

Note6) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note7) NCLK count of each Horizontal Scanning Time should be always the same.
V-Blanking period should be “*n*” X “Horizontal Scanning Time”. (*n*: integer)
Frame period should be always the same.

CONNECTOR PIN ASSIGNMENT FOR INTERFACE

CN1 INPUT SIGNAL

Connector : FI-XB30SRL-HF11/JAPAN AVIATION ELECTRONICS INDUSTRY,LTD.)
[Mating Connector : FI-X30M,FI-X30MR]

Terminal No.	Symbol	Function
1	GND	Ground
2	VDD	Power Supply:+3.3V
3	VDD	Power Supply:+3.3V
4	N. C.	Non Connection
5	N. C.	Non Connection
6	N. C.	Non Connection
7	N. C.	Non Connection
8	OIN0-	ODD Transmission Data of Pixels 0(Negative:-)
9	OIN0+	ODD Transmission Data of Pixels 0(Positive:+)
10	GND	Ground
11	OIN1-	ODD Transmission Data of Pixels 1(Negative:-)
12	OIN1+	ODD Transmission Data of Pixels 1(Positive:+)
13	GND	Ground
14	OIN2-	ODD Transmission Data of Pixels 2(Negative:-)
15	OIN2+	ODD Transmission Data of Pixels 2(Positive:+)
16	GND	Ground
17	OCLK-	ODD Sample Clock(Negative:-)
18	OCLK+	ODD Sample Clock(Positive:+)
19	GND	Ground
20	EIN0-	EVEN Transmission Data of Pixels 0(Negative:-)
21	EIN0+	EVEN Transmission Data of Pixels 0(Positive:+)
22	GND	Ground
23	EIN1-	EVEN Transmission Data of Pixels 1(Negative:-)
24	EIN1+	EVEN Transmission Data of Pixels 1(Positive:+)
25	GND	Ground
26	EIN2-	EVEN Transmission Data of Pixels 2(Negative:-)
27	EIN2+	EVEN Transmission Data of Pixels 2(Positive:+)
28	GND	Ground
29	ECLK-	EVEN Sample Clock(Negative:-)
30	ECLK+	EVEN Sample Clock(Positive:+)

Note 1) Please connect NC pin to nothing. Don't connect it to grand nor to other signal input.
Please connect GND to ground. Don't use it as no-connect nor connection with high impedance.

Note 2) 262,144 colors are displayed by the combinations of 18 bits data. (See next page)

CN2 CCFL POWER SOURCE

Connector : BHSR-02VS-1/JAPAN SOLDERLESS TERMINAL MFG CO., LTD.
[Mating Connector : SM02B-BHSS-1-TB/JAPAN SOLDERLESS TERMINAL MFG CO., LTD.]

Terminal No.	Symbol	Function
1	V_{FLH}	CCFL POWER SUPPLY (HIGH VOLTAGE)
2	V_{FLL}	CCFL POWER SUPPLY (LOW VOLTAGE)

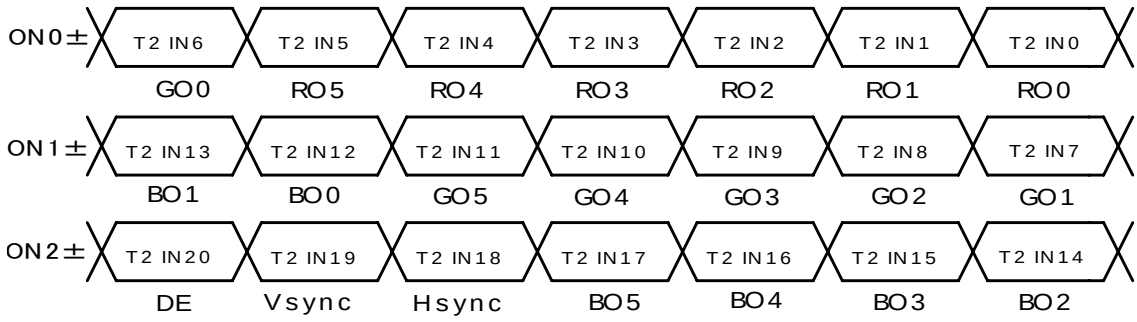
RECOMMENDED TRANSMITTER (THC63LVDM63A)TO LT141DENQP00 INTERFACE ASSIGNMENT

6bit Transmitter

ODD Data

THC63LVDM63A					LT141DENQP00 Interface (CN1)	
Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol		
Symbol	Terminal	Symbol	Function		Terminal	Symbol
T2IN0/TA0	44	RO0	Red Pixels Display Data (LSB)	T2OUT0- T2OUT0+	No.8 No.9	ON0- ON0+
T2IN1/TA1	45	RO1	Red Pixels Display Data			
T2IN2/TA2	47	RO2	Red Pixels Display Data			
T2IN3/TA3	48	RO3	Red Pixels Display Data			
T2IN4/TA4	1	RO4	Red Pixels Display Data			
T2IN5/TA5	3	RO5	Red Pixels Display Data (MSB)			
T2IN6/TA6	4	GO0	Green Pixels Display Data (LSB)			
T2IN7/TB0	6	GO1	Green Pixels Display Data	T2OUT1- T2OUT1+	No.11 No.12	ON1- ON1+
T2IN8/TB1	7	GO2	Green Pixels Display Data			
T2IN9/TB2	9	GO3	Green Pixels Display Data			
T2IN10/TB3	10	GO4	Green Pixels Display Data			
T2IN11/TB4	12	GO5	Green Pixels Display Data (MSB)			
T2IN12/TB5	13	BO0	Blue Pixels Display Data (LSB)			
T2IN13/TB6	15	BO1	Blue Pixels Display Data			
T2IN14/TC0	16	BO2	Blue Pixels Display Data	T2OUT2- T2OUT2+	No.14 No.15	ON2- ON2+
T2IN15/TC1	18	BO3	Blue Pixels Display Data			
T2IN16/TC2	19	BO4	Blue Pixels Display Data			
T2IN17/TC3	20	BO5	Blue Pixels Display Data (MSB)			
T2IN18/TC4	22	HSYNC	H-Sync			
T2IN19/TC5	23	VSYNC	V-Sync			
T2IN20/TC6	25	DE	Compound Synchronization Signal			
T2CLK IN/CLK IN	26	ONCLK	Data Sampling Clock	T2CLK OUT - T2CLK OUT +	No.17 No.18	OCLK- OCLK+

Note 1) Please connect NC pin to nothing. Don't connect it to ground nor to other signal input.

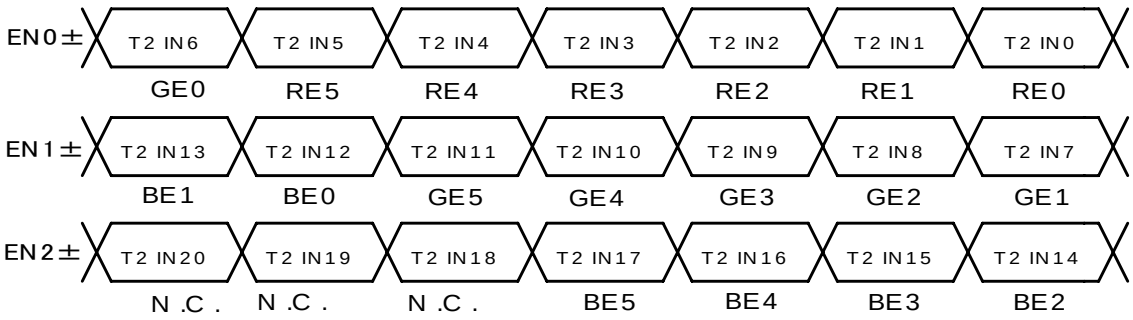


RECOMMENDED TRANSMITTER (THC63LVDM63A) TO LT141DENQP00 INTERFACE ASSIGNMENT

6bit Transmitter

EVEN Data

THC63LVDM63A					**LT141DENQP00 Interface** (CN1)	
Input Terminal No.		Input Signal (Graphics controller output signal)		Output Signal Symbol		
Symbol	Terminal	Symbol	Function		Terminal	Symbol
T2IN0/TA0	44	RE0	Red Pixels Display Data (LSB)	T2OUT0- T2OUT0+	No.20 No.21	EN0- EN0+
T2IN1/TA1	45	RE1	Red Pixels Display Data			
T2IN2/TA2	47	RE2	Red Pixels Display Data			
T2IN3/TA3	48	RE3	Red Pixels Display Data			
T2IN4/TA4	1	RE4	Red Pixels Display Data			
T2IN5/TA5	3	RE5	Red Pixels Display Data (MSB)			
T2IN6/TA6	4	GE0	Green Pixels Display Data (LSB)			
T2IN7/TB0	6	GE1	Green Pixels Display Data	T2OUT1- T2OUT1+	No.23 No.24	EN1- EN1+
T2IN8/TB1	7	GE2	Green Pixels Display Data			
T2IN9/TB2	9	GE3	Green Pixels Display Data			
T2IN10/TB3	10	GE4	Green Pixels Display Data			
T2IN11/TB4	12	GE5	Green Pixels Display Data (MSB)			
T2IN12/TB5	13	BE0	Blue Pixels Display Data (LSB)			
T2IN13/TB6	15	BE1	Blue Pixels Display Data			
T2IN14/TC0	16	BE2	Blue Pixels Display Data	T2OUT2- T2OTU2+	No.26 No.27	EN2- EN2+
T2IN15/TC1	18	BE3	Blue Pixels Display Data			
T2IN16/TC2	19	BE4	Blue Pixels Display Data			
T2IN17/TC3	20	BE5	Blue Pixels Display Data (MSB)			
T2IN18/TC4	22	N.C.	Non Connection			
T2IN19/TC5	23	N.C.	Non Connection			
T2IN20/TC6	25	N.C.	Non Connection			
T2CLK IN/CLK IN	26	CLK	Data Sampling Clock	T2 CLKOUT - T2 CLK OUT+	No.29 No.30	ECLK- ECLK+



256k (k=1024) COLORS COMBINATION TABLE

	Display	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0	Gray Scale Level
Basic Color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	L	L	L	L	L	L	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray Scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L 0
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L 1
		L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L 2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3… L60
		H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L61
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L62
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	Red L63
Gray Scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L 0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L 1
		L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L 2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3… L60
		L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L	L61
		L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L62
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	Green L63
Gray Scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L 0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L 1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L 2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3… L60
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H	L61
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L62
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	Blue L63
Gray Scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L 0
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L 1
		L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L	L 2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3… L60
		H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L61
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L62
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L63

FOR SAFETY

LCD module is generally designed with precise parts to achieve light weighted thin mechanical dimensions.
In using our Modules, make certain that you fully understand and put into practice the warnings and safety precautions detailed in Engineering Information No.EE-D-001A,"CAUTIONS AND INSTRUCTIONS FOR TOSHIBA MOBILE DISPLAY LCD MODULES".
Refer to individual specifications and TECHNICAL DATA sheets (hereinafter called "TD") for more detailed technical information.

1) SPECIAL PURPOSES

A) Toshiba Mobile Display's Standard LCD Modules have not been customized for operation in extreme environments or for use in applications where performance failures could be life-threatening or otherwise catastrophic.

B) Since Toshiba Mobile Display's Standard LCD Modules have not been designed for operation in extreme environments, they must never be used in devices that will be exposed to abnormally high levels of vibration or shock which exceed Toshiba Mobile Display's published specification limits.

C) In addition, since Toshiba Mobile Display’s Standard LCD Modules have not been designed for use in applications where performance failures could be life-threatening or catastrophic, they must never be installed in aircraft navigation control systems (such as, but not limited to Traffic Collision Avoidance System and Air Traffic Indicator), in military defense or weapons systems, in critical industrial process-control systems (e.g., those involved in the production of nuclear energy), or in critical medical device or patient life-support systems.

2) DISASSEMBLING OR MODIFICATION

DO NOT DISASSEMBLE OR MODIFY the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display.
Toshiba Mobile Display doses not warrant the module, if customer disassembled or modified it.

3) BREAKAGE OF LCD PANEL

DO NOT INGEST liquid crystal material, DO NOT INHALE this material, and DO NOT CONTACT the material with skin, if LCD panel is broken and liquid crystal material spills out.
If liquid crystal material comes into mouth or eyes, rinse mouth or eyes out with water immediately.
If this material contact with skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

4) GLASS OF LCD PANEL

BE CAREFUL WITH CHIPS OF GLASS that may cause injuring fingers or skin, when the glass is broken.

5) ELECTRIC SHOCK

DISCONNECT POWER SUPPLY before handling LCD module.
DO NOT TOUCH the parts inside LCD module and the fluorescent lamp's connector or cables in order to prevent electric shock, because high voltage is supplied to these parts from the inverter unit while power supply is turned on.

6) ABSOLUTE MAXIMUM RATINGS AND POWER PROTECTION CIRCUIT

DO NOT EXCEED the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts' constants, environmental temperature, etc., otherwise LCD module may be damaged.
Employ protection circuit for power supply, whenever the specification or TD specifies it.
Suitable protection circuit should be applied for each system design.

7) DISPOSAL

When dispose LCD module, obey to the applicable environmental regulations.